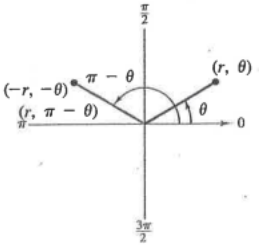
Calculus Warm Up # 9-2

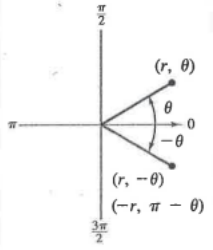
No warm up

Tests for symmetry: check if the indicated substitution produces an equivalent equation.



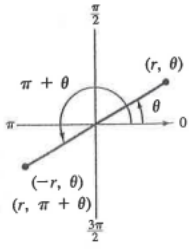
Symmetry with respect to the line $\theta = \pi/2$

Replace (r, θ) with:
$(r, \pi - \theta)$ or $(-r, -\theta)$



Symmetry with respect to the polar axis

Replace (r, θ) with:
$(r, -\theta)$ or $(-r, \pi - \theta)$



Symmetry with respect to the pole

Replace (r, θ) with:
$(r, \pi + \theta)$ or $(-r, \theta)$

Polar graphing with calculator: Polar Mode

$r = 4\sin\theta$

window

θ: $[0, 2\pi]$

x: [- 6, 6]

y: [- 4, 4]

Mess with θ step to see what it does!

length of each straight line

θ step = 0.05

Graphing Screen Dimensions:

Maintain an aspect ratio of 3:2, (x:y), for best picture.

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2) $r = 1 - 2\cos\theta$

window

θ: $[0, 2\pi]$

x: $[-3, 3]$

y: $[-2, 2]$

θ step = 0.05

3) $r = \sin 6\theta$

window

θ: $[0, 2\pi]$

x: $[-1.5, 1.5]$

y: $[-1, 1]$

θ step = .05

4) $r = \theta$

window

θ: [0, 12π]

x: [-36, 36]

y: [-24, 24]

θ step = .05

5) $r = \frac{2}{\theta}$

window

θ: [-5π, 5π]

x: [-4, 4]

y: [-1, 2]

θ step =

A rose curve: $r = 2 \sin 3\theta$

window

θ: [0, π]

x: [-3, 3]

y: [-2, 2]

θ step = 0.05

mess with θ step for cool abstract art.

For $r = 2\sin 3\theta$, find by hand the equation of the tangent line at $\theta = \frac{\pi}{6}$

$$\frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{\frac{d}{d\theta}(2\sin 3\theta)(\sin\theta)}{\frac{d}{d\theta}(2\sin 3\theta)(\cos\theta)} = \frac{(2\sin 3\theta)\cos\theta + (6\cos 3\theta)\sin\theta}{-(2\sin 3\theta)(\sin\theta) + (6\cos 3\theta)\cos\theta}$$

$y = r\sin\theta$

$x = r\cos\theta$

$y - y_1 = m(x - x_1)$

$m = -\sqrt{3}$

$$y - 1 = -\sqrt{3}\left(x - \sqrt{3}\right)$$

Check the value of the slope on your grapher...

from graph screen: 2nd Calc $\frac{dy}{dx}$

2nd $\pi \div 6$

≈ -1.73

A rose curve

For $r = a\sin b\theta$

Determine the role of a & b and the characteristics of the rose curve produced. (ie: # of petals, symmetry)

on $[0, \pi]$

a = length of petals.

b = # of petals

even b has x axis symmetry

odd b has y axis symmetry.

$[0, 2\pi]$

b - odd

# of petals = b

Sym: y-axis w/respect to the pole (origin sym)

b - even

# of petals = 2b

Sym: x & y-axis

Play with $r = a \cos b\theta$

Interval needed to produce the whole thing?

Role of a & b?

Symmetry?

on $[0, \pi]$
b - odd
x - axis sym.

on $[0, 2\pi]$
b even
x - axis } sym.
& y - axis }

Limaçon Curves (LEE-ma-sohn)

$r = a \pm b \sin\theta$ or $r = a \pm b \cos\theta$

For $a > 0$ and $b > 0$

Explore the ratio $\frac{a}{b}$

- < 1 With Loop
- $= 1$ Cartiod
- $(1, 2)$ Dimpled
- ≥ 2 Convex

Match:

HW: Summarize your findings from the classwork investigations.

Practice with polar derivatives and tangent lines:

p. 707, # 1, 2, 7 all by hand

11, 12, 14 with grapher

30 - 36 even, with grapher